

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

LAND RECLAMATION, HIGHWALL TREATMENT

(No. and m, ft)

CODE 456

DEFINITION

Reducing harmful effects of highwalls in abandoned mined areas.

PURPOSES

This practice may be applied as part of a resource management system to support one or more of the following:

- ☐ Reduce highwall heights or slopes to satisfactory levels to eliminate the hazard to human health and safety.
- ☐ Control erosion and sediment.
- ☐ Improve or maintain water quality.
- ☐ Improve landscape resource quality.
- ☐ Create conditions conducive to the establishment of protective cover.
- ☐ Return the area a beneficial land use.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to areas where highwalls resulting from past mining are:

1. a hazard to human health and safety;
2. unstable and contributing excessive sediment to adjacent land and waters; and
3. Degrading water quality, the environment, or landscape resources.

CRITERIA

Landscape (visual) resources

The appearance of the reclaimed site must be

in accordance with standards for maintaining and improving the visual quality of the landscape and must be comparable with adjacent undisturbed areas. Areas of high public visibility or those offering direct or indirect human benefits shall be evaluated and considered in a landscape resource management plan and design. Borrow areas are to be reshaped and vegetated as a part of the landscape plan and design.

Barriers to human access

Fencing and vegetative barriers may be used singularly or in combination. The type of fencing shall be "anti-intruder" chain link, barbed wire, or a net wire and barbed wire combination. If reduced visibility is desired, fencing such as black vinyl-coated wire should be considered.

Vegetative barriers shall consist of vigorous, durable plant species adapted to the site, with growth habits that provide a barrier to human access. Barriers are to be part of the landscape management plan.

Reduction (height or slope)

Consideration should be given to a combination of cut and fill or to partial reduction for meeting the objectives with the least cost.

Slope stability

Highwalls in rock formations may be stable on steep slopes. In these cases, treatment needs may be limited to the control of rolling or falling rocks. Fences or dikes at the base of the

slope may be used as control measures.

Highwalls in earth, fractured rock, or other weak materials are to be evaluated to determine if an analysis of the failure potential is needed. Measures developed to prevent or stabilize failures associated with highwalls shall be based on engineering judgment and an analysis made by an engineer trained and experienced in soil mechanics.

Slope stability analysis shall account for all critical soil and loading conditions. The strength parameters of natural soil and rock or of waste materials shall be based on the appropriate conditions for each site. Long-term strength parameters ($c = 0$ and internal friction based on residual shear) are often required. The methods of slope stability analysis are to be appropriate for the loading conditions and for the location and shape of the potential failure surfaces. Appropriate safety factors shall be provided based on the degree of uncertainty in the soil strength values used, the soil and water conditions assumed, and the details of the analysis used.

If there is a potential for loss of life or damage to farmsteads, residential areas, frequently traveled roads, or other occupied facilities, the measures shall include removal of the highwall or use of other control measures that ensure safety.

Earthquake or seismic forces are to be considered in the appropriate locations. The criteria for geologic investigations, seismic assessments, and minimum seismic coefficients associated with earthquakes shall apply as contained in Technical Release No. 60 for earth dams.

Water disposal

The need for drainage, erosion control, and water disposal systems shall be carefully analyzed and needed systems included in the design. Acid water discharges must be treated as necessary to meet the environmental requirements of the receiving waters as prescribed by the state regulatory agency.

Other practices

All individual practice components shall be designed and installed in accordance with appropriate NRCS standards and specifications. Where standards do not exist, applicable current technology shall be used.

CONSIDERATIONS

1. Geology and the associated subsurface conditions of the highwall area.
2. Surface and subsurface hydrologic conditions.
3. Land use, land ownership, dwellings, and other improvements in the adjacent area.
4. Slide or failure potential.
5. Contribution of sediment to offsite areas.
6. Availability of backfill material.
7. Landscape (visual) resources.
8. Extent and quality of associated wetland areas.
9. Water quality.
10. Surface water disposal.

The existence of a highwall does not necessarily mean that treatment is required. Three basic types of problems should be considered for treatment. One of these types exists when the highwall is near roads, schools, parks, dwellings, or other populated areas and presents a substantial hazard to human health and safety. The potential for occasional exposure by humans to the unsafe condition does not qualify as a substantial hazard. Another type to consider is when the site is unstable with actual or potential failure, is contributing excessive sediment to adjacent land or waters, or is otherwise degrading the environment. The third type of problem exists when the highwall is determined to be a significant visual degrader. A highwall may have positive, negative, or even neutral effects on visual quality. Its existence may add a desirable element of variety to the landscape or may otherwise fit into a planned and pleasing landscape. Its location may also be so remote or obscure that it does not present a visual problem. Visibility is an important

consideration in making a determination about treatment.

Full consideration should be given to fencing and using vegetative barriers to reduce the probability of human injury; however, it should be recognized that barriers do not solve the problem. Major earthwork to reduce or eliminate the highwall will usually be required to remedy stability problems. Screening with trees may be effective in solving visual problems.

The elimination of water areas or wetlands as a result of highwall reduction may have adverse environmental effects. The quality of the water for fish, wildlife, and vegetative growth is a key factor in determining wetland classification. All significant wetlands and water areas must be properly classified and protected or losses mitigated in accordance with NRCS policies (see NRCS policy, 7 CFR 650). Acid or other toxic aqueous discharges should be treated according to the standard for Toxic Discharge Control (455).

The principles stated in this standard are also applicable to the treatment of highwalls not associated with mining.

Water Quantity

1. Effects on the components of the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, macropore and borehole flow, and ground water recharge.
2. Variability of the practice's effects caused by seasonal and climatic changes.
3. Effects of vegetation on soil moisture.
4. Effects of snowcatch and melt on water budget components.
5. Effects on downstream flow and aquifers that would affect other water uses or users.
6. Effects on the volume of downstream flow that might cause undesirable environmental, social or economic effects.

7. Potential for water use control, and management.

Water Quality

1. Effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff or seepage.
2. Effects on the visual quality of onsite downstream water resources.
3. Short-term and construction-related effects on the quality of downstream surface and ground water.
4. Potential for uncovering and redistributing toxic material.
5. Effects on the movement of dissolved substances below the root zone and toward the ground water.
6. Effects on wetlands and water-related wildlife habitats.

PLANS AND SPECIFICATIONS

Plans and specifications for highwall treatment shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve the intended purpose.

OPERATION AND MAINTENANCE

Maintenance activities are to be outlined in a maintenance plan. Water management systems, erosion control systems, vegetative cover, and barriers are to be maintained to accomplish their intended purposes. Regular periodic inspections must be carried out and needed repairs made promptly.